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EXAMINER	
ROCHE, JOHN B	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/687,786	LIEN ET AL.	
	Examiner	**Art Unit**	
	JOHN B. ROCHE	2184	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-14 , and 21 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 1 recites a system, which is interpreted as a computer program (e.g., data structures, lines 2, 4, 8); however, the claim fails to assert the program recorded on an appropriate computer-readable medium so as to be structurally and functionally interrelated to the medium and permit the function of the descriptive material to be realized. Since a computer program is merely a set of instructions capable of being executed by a computer without a computer-readable medium needed to realize the computer program's functionality, it is regarded as nonstatutory functional descriptive material. Similar problems exist in claims 2-14, and 21. Note the means in claim 21 is interpreted as a code means. See MPEP 2106.01 for details.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 8 recites the limitation "linked-list data structures" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Invoked - 35 USC § 112 6th

Claims 21 and 28 invoke 35 U.S.C. 112, 6th paragraph.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1 and 3-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Harriman et al. (US 5,898,687), hereafter referred to as Harriman et al.'687.

7. Referring to claim 1, Harriman et al.'687 anticipates a packet transmit queue control system comprising a first data structure (unicast output queue as seen in figure 3 and column 7, line 14) coupled to a packet controller (controller 254 as seen in figure 2 and column 7, line 12) and configured to store a plurality of first type packet pointers (each port of the switch has unicast output queue as seen in figure 3 and column 7, lines 13-14); a second data structure (multicast output queue as seen in figure 3 and column 7, line 14) coupled to the packet controller (controller 254 as seen in figure 2 and column 7, line 12) and configured to store a plurality of second type packet pointers (each port of the switch has multicast output queue as seen in figure 3 and column 7, lines 13-14), wherein the packet controller is configured to receive a first sequence of packet pointers (address pointer 128 as seen in figure 1 and column 4, lines 38-39) and to provide each packet pointer to one of the first and second data structures (novel fair-sharing arbitration policy 300 as seen in figure 3 and column 7, line 8); and a port transmit controller (strict priority component 320 as seen in figure 3 and column 7, lines 32-33) coupled to

the first and second data structures and configured to provide a second sequence of packet pointers (data from queue occupancy calculation in SP component 320 determines priority as seen in figure 3 and column 7, lines 20-23).

8. As to claim 3, Harriman et al.'687 also anticipates that the second data structure includes a plurality of first-in first-out structures (dedicated multicast output queue for each output port of the switch at each priority level, column 2, lines 38-41).

9. As to claim 4, Harriman et al.'687 also anticipates that each of the plurality of FIFO structures is coupled to a port (dedicated multicast output queue for each output port of the switch at each priority level, column 2, lines 38-41).

10. As to claim 5, Harriman et al.'687 also anticipates that the first type packet pointers include unicast pointers (unicast output queue as seen in figure 3 and column 7, line 14); and the second type packet pointers include multicast pointers (multicast output queue as seen in figure 3 and column 7, line 14).

11. As to claim 6, Harriman et al.'687 also anticipates that the second sequence of packet pointers includes post transmit scheduling information (data from queue occupancy calculation in

SP component 320 determines priority as seen in figure 3 and column 7, lines 20-23).

12. As to claim 7, Harriman et al.'687 also anticipates that an ordering of the second sequence of packet pointers is substantially consistent with a packet arrival order (at each cell time, arbitration mechanism 300 evaluates states of queue pairs, transmitting a cell from a non-empty pair having the highest priority as seen in figure 3 and column 7, lines 17-20).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harriman et al.'687.

15. As to claim 2, Harriman et al.'687 does not teach that the first data structure includes a plurality of linked-list data structures. However, a plurality of linked-list data structures is simply an alternative arrangement of the art.

16. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687's system to incorporate that the first data structure includes a plurality of linked-list data structures. The motivation to combine these teachings is to increase the replication rate of a switching fabric circuit having a multicasting capability that requires minimal buffer capacity for multicast connection traffic (column 1, lines 60-64).

17. As to claim 8, Harriman et al.'687 teaches that the packet controller is configured to provide each of the plurality of second type packet pointers (each port of the switch has multicast output queue as seen in figure 3 and column 7, lines 13-14) to each or a group of the plurality of FIFO structures (dedicated multicast output queue for each output port of the switch at each priority level, column 2, lines 38-41).

18. Harriman et al.'687 does not teach that the packet controller is configured to provide each of the plurality of first type packet pointers to a selected one of the plurality of linked-list data structures. However, providing each of the plurality of first type packet pointers to a selected one of the plurality of linked-list data structures is simply an alternative arrangement of the art.

19. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687's system to incorporate that the packet controller is configured to provide each of the plurality of first type packet pointers to a selected one of the plurality of linked-list data structures. The motivation to combine these teachings is to increase the replication rate of a switching fabric circuit having a multicasting capability that requires minimal buffer capacity for multicast connection traffic (column 1, lines 60-64).

20. Claims 9-12 and 14-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harriman et al.'687 in view of Raza et al. (US 7,016,349), hereafter referred to as Raza et al.'349.

21. As to claim 9, Harriman et al.'687 teaches a data arrangement for packet transit queue control, comprising a first data structure configured to store a plurality of first type packet pointers (unicast output queue as seen in figure 3 and column 7, line 14); and a second data structure configured to store a plurality of second type packet pointers (multicast output queue as seen in figure 3 and column 7, line 14).

22. However, Harriman et al.’687 does not teach a third data structure coupled to the second data structure and configured to store a plurality of status flags.

23. Raza et al.’349 teaches a third data structure (logic block 108' as seen in figure 6 and column 7, line 52) coupled to the second data structure (read interface 106’ as seen in figure 6 and column 7, line 50) and configured to store a plurality of status flags (flags for a particular queue, column 7, lines 48-49).

24. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.’687’s system to incorporate, as taught by Raza et al.’349, a third data structure coupled to the second data structure and configured to store a plurality of status flags. The motivation to combine these teachings is to enable an apparatus to extract in-band information or skip extraction and perform a look ahead operation (column 3, lines 13-17).

25. Note that claim 30 contains the corresponding limitations of claim 9 as shown above; therefore, it is rejected using the same reasoning accordingly.

26. Claims 10-12 contain the corresponding limitations of claims 2-3 and 5 respectively, as shown above; therefore, they are rejected using the same reasoning accordingly.

27. As to claim 14, Harriman et al.’687 does not teach that the plurality of status flags includes a first type packet pointer head position indication; a first type packet pointer tail position indication; an overall head pointer indication; and an overall tail pointer indication.

28. Raza et al.’349 teaches that the plurality of status flags includes a first type packet pointer head position indication (UNICAST_HPTR as seen in figure 10 and column 11, lines 14-15); a first type packet pointer tail position indication (tail pointer address as seen in figure 14 and column 14, lines 60-61); and an overall head pointer indication (UNICAST_HPTR and MULTICAST_HPTR as seen in figure 10 and column 11, lines 18-20).

29. While neither Harriman et al.’687 nor Raza et al.’349 teaches an overall tail pointer indication, said over tail pointer indication is simply an alternative arrangement in the art.

30. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687's system to incorporate, as taught by Raza et al.'349, that the plurality of status flags includes a first type packet pointer head position indication; a first type packet pointer tail position indication; an overall head pointer indication; and an overall tail pointer indication. The motivation to combine

these teachings is to enable an apparatus to extract in-band information or skip extraction and perform a look ahead operation (column 3, lines 13-17).

31. As to claim 15, Harriman et al.'687 teaches (a) determining if a pointer is a first type or a second type (generating a key over line 132 indicating whether a cell requires multicast replication as seen in figure 1 and column 4, lines 41-43); (b) if the pointer is the first type, determining if an overall tail is the first type or the second type (generating a key over line 132 indicating whether a cell requires multicast replication as seen in figure 1 and column 4, lines 41-43); and (c) if the pointer is the second type, determining if the overall tail is the first type or the second type (generating a key over line 132 indicating whether a cell requires multicast replication as seen in figure 1 and column 4, lines 41-43).

32. However, Harriman et al.'687 does not teach (b) if the pointer is the first type, determining if an overall tail is the first type or the second type; if the overall tail is the second type, setting an overall tail flag to a first state, and setting an entry to the first state; getting a first type tail; linking the pointer in a first data structure to the first type tail; and setting the first type tail to the pointer; and (c) if the pointer is the second type, determining if the overall tail is

the first type or the second type; if the overall tail is the second type, adding the pointer to a second data structure field with a second state; if the overall tail is the first type, adding the pointer to the second data structure field with the first state; and writing the overall tail flag to the second state.

33. Raza et al.’349 teaches (b) if the pointer is the first type and the overall tail is the second type, setting an overall tail flag to a first state (system 400 allowing a multicast queue to send to a single location and unicast queue to implement complex processing as seen in figure 13 and column 14, lines 27-29), and setting an entry to the first state (system 400 allowing a multicast queue to send to a single location and unicast queue to implement complex processing as seen in figure 13 and column 14, lines 27-29); getting a first type tail (tail pointer fetched from the FIFO pointer memory 134 as seen in figure 5 and column 7, lines 9-12); linking the pointer in a first data structure to the first type tail (address logic block 130 requests data from pointer memory 134 when a new queue address is requested as seen in figure 5 and column 7, lines 29-32); and setting the first type tail to the pointer (configuration logic 502 writes to queue pointer memory 504 as seen in figure 14 and column 15, lines 2-3); and (c) if the

pointer is the second type and the overall tail is the second type, adding the pointer to a second data structure field with a second state (system 400 generates and stores multicast addresses as seen in figure 13 and column 14, lines 23-25); if the overall tail is the first type, adding the pointer to the second data structure field with the first state (system 400 allowing a multicast queue to send to a single location and unicast queue to implement complex processing as seen in figure 13 and column 14, lines 27-29); and writing the overall tail flag to the second state (configuration logic 502 writes to queue pointer memory 504 as seen in figure 14 and column 15, lines 2-3).

34. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687's system to incorporate, as taught by Raza et al.'349, (b) if the pointer is the first type, determining if an overall tail is the first type or the second type; if the overall tail is the second type, setting an overall tail flag to a first state, and setting an entry to the first state; getting a first type tail; linking the pointer in a first data structure to the first type tail; and setting the first type tail to the pointer; and (c) if the pointer is the second type, determining if the overall tail is the first type or the second type; if the overall tail is the

second type, adding the pointer to a second data structure field with a second state; if the overall tail is the first type, adding the pointer to the second data structure field with the first state; and writing the overall tail flag to the second state. The motivation to combine these teachings is to enable an apparatus to extract in-band information or skip extraction and perform a look ahead operation (column 3, lines 13-17).

35. Claims 16-18 contain the corresponding limitations of claims 2-3 and 5 respectively, as shown above; therefore, they are rejected using the same reasoning accordingly.

36. As to claim 19, Harriman et al.'687 also teaches that the first state includes a yes-state (RR subarbiter "1" state as seen in figure 3 and column 7, lines 45-46); and the second state includes a no-state (RR subarbiter "0" state as seen in figure 3 and column 7, line 48).

37. Note that claim 26 contains the corresponding limitations of claim 19 as shown above; therefore, it is rejected using the same reasoning accordingly.

38. As to claim 20, Harriman et al.'687 does not teach that the first data structure is accessed at most once; and the second data structure is accessed at most once.

39. Raza et al.'349 teaches that the first data structure is accessed at most once (system 600 performs write operation into

main memory once every eight cycles as seen in figure 15 and column 15, lines 58-60); and the second data structure is accessed at most once (system 600 performs write operation into main memory once every eight cycles as seen in figure 15 and column 15, lines 58-60).

40. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687's system to incorporate, as taught by Raza et al.'349, that the first data structure is accessed at most once; and the second data structure is accessed at most once. The motivation to combine these teachings is to enable an apparatus to extract in-band information or skip extraction and perform a look ahead operation (column 3, lines 13-17).

41. Note that claim 27 contains the corresponding limitations of claim 20 as shown above; therefore, it is rejected using the same reasoning accordingly.

42. As to claim 22, Harriman et al.’687 does not teach (a) determining if an overall head is a first type; (b) if the overall head is the first type, getting a first type head; getting a first type pointer from a second data structure; determining if the first type head matches the first type pointer; if a match, setting an overall head flag to a second state; and updating the first type head with a next pointer from

a first data structure; and (c) if the overall head is a second type, getting a second type pointer from the second data structure; determining if a field in the second data structure is a first state or the second state; if the first state, setting the overall head flag to the first state; and removing a head entry from the second data structure.

43. Raza et al.'349 teaches determining if an overall head is a first type (UNICAST_HPTR and MULTICAST_HPTR as seen in figure 10 and column 11, lines 18-20); if the overall head is the first type: getting a first type head (head pointer fetched from storage element 134 as seen in figure 5 and column 7, lines 18-19); getting a first type pointer from a second data structure (UNICAST_HPTR may indicate the address of a head pointer of a unicast packet as seen in figure 10 and column 11, lines 38-40); determining if the first type head matches the first type pointer (READ_ADD_SYS and WRITE_ADD_SYS compared as seen in figure 19 and column 18, lines 53-54); if a match, setting an overall head flag to a second state (FIRST_MC_HPTR may indicate the address of a head pointer for a multicast packet as seen in figure 10 and column 11, lines 44-45); and updating the first type head with a next pointer from a first data structure (data written into dual-port memory 906 as seen in figure 19 and column 18, lines 63-64); and if the overall head is a second

type: getting a second type pointer from the second data structure (MULTICAST_HPTR may indicate a head pointer for multicast packets as seen in figure 10 and column 11, lines 19-20); determining if a field in the second data structure is a first state or the second state (UNICAST_HPTR and MULTICAST_HPTR as seen in figure 10 and column 11, lines 18-20); if the first state, setting the overall head flag to the first state (signal UNICAST_HPTR may indicate the address of a head pointer for unicast packets as seen in figure 10 and column 11, lines 38-40); and removing a head entry from the second data structure (a popped head pointer indicates when done reading from a block, pop a next block from the current queue as seen in figure 10 and column 11, lines 30-32).

44. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687's system to incorporate, as taught by Raza et al.'349, determining if an overall head is a first type; if the overall head is the first type, getting a first type head; getting a first type pointer from a second data structure; determining if the first type head matches the first type pointer; if a match, setting an overall head flag to a second state; and updating the first type head with a next pointer from a first data structure; and if the overall head is a second type, getting a second type pointer

from the second data structure; determining if a field in the second data structure is a first state or the second state; if the first state, setting the overall head flag to the first state; and removing a head entry from the second data structure. The motivation to combine these teachings is to enable an apparatus to extract in-band information or skip extraction and perform a look ahead operation (column 3, lines 13-17).

45. Note that claims 28-29 contain the corresponding limitations of claim 22 as shown above; therefore, it is rejected using the corresponding limitations accordingly.

46. Claims 23-25 contain the corresponding limitations of claims 2-3 and 5 respectively, as shown above; therefore, they are rejected using the same reasoning accordingly.

47. Claim 31 contains the corresponding limitations of claim 1 as shown above; therefore, it is rejected using the same reasoning accordingly.

48. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harriman et al.'687 in view of Raza et al.'349 as applied to claim 12 above, and further in view of Chen et al. (US 6,958,973), hereafter referred to as Chen et al.'973.

49. As to claim 13, Harriman et al.'687 teaches that each entry of the second data structure includes a packet pointer field (address pointer, column 2, line 19).

50. However, neither Harriman et al.'687 nor Raza et al.'349 teaches that each entry of the second data structure also includes a previous unicast pointer indication field; a next unicast pointer indication field; and a previous unicast pointer field.

51. Chen et al.'973 teaches that each entry of the second data structure also includes a previous unicast pointer indication field (unicast packet must be enqueued into port output queue preceding multicast packets, column 8, lines 6-8); a next unicast pointer indication field (input skip count register of port set into skip count field when next unicast packet is enqueued, column 8, lines 14-16); and a previous unicast pointer field (previous unicast packet location must be known in order to properly ascertain the number of multicast packets following said previous unicast packet).

52. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Harriman et al.'687 and Raza et al.'349's system to incorporate, as taught by Chen et al.'973, that each entry of the second data structure also includes a previous unicast pointer indication field; a next

unicast pointer indication field; and a previous unicast pointer field. The motivation to combine these teachings is to provide an improved and simplified output queuing method for forwarding packets in sequence (column 5, lines 3-5).

Conclusion

53. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

54. McKeown (US 6,212,182), hereafter referred to as McKeown’182, teaches combined unicast and multicast scheduling.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN B. ROCHE whose telephone number is (571)270-1721. The examiner can normally be reached on 8:30 am - 5:00 pm, M-F EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Henry Tsai can be reached on 571-272-4176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JR

/Henry W.H. Tsai/
Supervisory Patent Examiner, Art Unit 2184